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CERTIFICATE

This certificate is issued in support of an application for Patent registration in a country outside New Zealand pursuant to the Patents Act 1953 and the Regulations thereunder.

I hereby certify that annexed is a true copy of the Provisional Specification as filed on 28 October 2003 with an application for Letters Patent number 529183 made by Ecoglo Limited.

Dated 4 November 2004.

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330 High Street, Lower Hutt
PO Box 30687, Lower Hutt, New Zealand or DX SX 11129, Wellington
Freephone: 0508 4 IPONZ (0508 447 669), International callers dial: +64 3 962 2607, Fax: +64 4 560 1691, www.iponz.govt.nz

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PATENTS FORM NO. 4

Appln Fee: $50.00

James & Wells ref: 42532/24

PATENTS ACT 1953

PROVISIONAL SPECIFICATION

Method of forming a slip-resistant photo-luminescent device

WE, Ecoglo Ltd, a New Zealand company of P O Box 8654, Christchurch, New Zealand, do hereby declare this invention to be described in the following statement:

Method of forming a slip-resistant photo-luminescent device

TECHNICAL FIELD

The present invention relates to the manufacture of slip-resistant photo-luminescent devices for surfaces such as stair treads and in particular to strips made from powdered resins.

BACKGROUND ART

Many environments exist wherein safety or other considerations are improved by the availability of a surface which provides a marking visible in darkness, together with improved friction. A typical application is for markings, signage or the like for steps, floors, hand rails and ladders which combine photo-luminescent materials to help guide building occupants to safety during blackout situations, together with an anti-slip coating for safety.

US patent no. 5 103 608 describes a stair nosing comprising an extrusion having strips of photo-luminescent paint alternating with raised strips of slip-resistant material. This device is relatively costly to manufacture, owing to the difficulties of assembling, or otherwise forming the strips of slip-resistant material into the dovetail grooves in the extrusion.

The applicant's NZ patent no. 517253 describes a method and apparatus for manufacturing a nosing for stairs comprising an angle section having channels into which a thermosetting resin and pigment are applied to form photo-luminescent strips. The photo-luminescent material of the strips stores up energy while the stairway is lighted, then when the stairway is darkened, the photo-luminescent material emits the stored energy in the form of visible light, thus alerting users of the area to the presence of the stairs. The edges of the channels protrude to contrast to the radiance of the luminescent material in the channels for enhanced visibility. The

channel edges also form non-slip strips and present a foot-engaging surface which protrudes above the luminescent strips. Thus foot traffic contacts only the foot-engaging surface and the recessed luminescent material is protected from excessive damage and wear.

It will be appreciated that there is a need for an improved device for marking stairs, or the like, and a method of manufacturing same. It would be advantageous if such a method provided a device with a greater degree of slip resistance than that of the device of NZ patent no. 517253 without an increased number of manufacturing operations.

It is an object of the present invention to address the foregoing needs or at least to provide the public with a useful choice.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

Any publication cited in this specification is hereby incorporated by reference, however this does not constitute an admission that the document forms part of the common general knowledge in the art, in New Zealand or in any other country. The applicant reserves the right to challenge the pertinency of any publication cited herein, or to challenge the accuracy of any assertion made in a cited publication. As used herein, the word "comprises" means "includes, but is not limited to" and its derivatives have a corresponding meaning.

DISCLOSURE OF THE INVENTION

According to one aspect of the present invention there is provided a method of manufacturing a slip-resistant photo-luminescent device, including the steps:

dispensing first and second powdered components into respective recesses provided in a substrate, the first powdered component including a resin and a photo-luminescent pigment, the second powdered component including a resin and friction enhancing material, and

heating the powdered components to fuse the resins and bond them to surfaces of the respective recesses.

The same or different classes or compositions of resin may be used on each powdered component, but preferably the resins are thermosets for improved mechanical properties such as strength and wear resistance. Most preferably both resins are different compositions of polyester resins.

The first and second powdered components are preferably dispensed simultaneously into an elongate substrate, thus reducing manufacturing time and costs e.g. compared to dispensing them in separate runs through one dispenser.

Preferably each powdered component is gravity fed from a hopper through a die with an opening therein into at least one respective recess, the die having a face adapted for sliding engagement with the substrate. The hoppers may be fixed and spaced apart above means for supporting the substrate upright for sliding movement between the dies.

According to another aspect of the present invention there is provided a slip-resistant photo-luminescent device formed from the above-described method, the device

including:

an elongate substrate having first and second elongate recesses formed therein;

a photo-luminescent strip bonded to the surface of the first recess;

an anti-slip strip bonded to the surface of the second recess, and characterised in that

a channel is formed between the first and second recesses.

This slip-resistant photo-luminescent device is particularly adapted to be manufactured by the above-described method to avoid contamination of the strips which may otherwise occur should traces of the first and second components spill from the adjacent recesses. The channel may contain any trace amounts of the components that are spilled thereinto, thus improving the aesthetics of the finished device.

Slip-resistant photo-luminescent devices may be economically manufactured by the method of the present invention, avoiding the costs of additional forming or assembly stages. The simplicity of the method means it can be performed using simple, low cost equipment.

BRIEF DESCRIPTION OF THE DRAWINGS

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1 is a schematic of apparatus for performing the process of the present invention;

Figure 2a is a transverse view of a substrate of the device prior to a first stage of

the process of the present invention;

Figure 2b is a transverse view of the device after a first stage of the process of the present invention;

Figure 2c is a transverse view of a substrate of the device after a second stage of the process of the present invention, and

Figure 3a is a side view of the dispenser of the apparatus of Fig. 1;

Figure 3b is and end view of the dispenser of Fig. 3a, and

Figure 4 is partly cut away pictorial view of the dispenser of Fig. 3a.

BEST MODES FOR CARRYING OUT THE INVENTION

Apparatus for forming a slip-resistant photo-luminescent device according to the present invention is schematically illustrated in Fig. 1 and includes transport means 1 for moving an elongate substrate 7 (see Figs. 2a-2c) from a loading station 2, through a dispenser 3, an oven 4, and a cooler 5 to an unloading station 6.

Figs 2a-2c show transverse sections through the substrate 7 at successive stages in the manufacturing process. Referring to Fig. 2a, the substrate 7 loaded at station 2 has an upper face 11 and an opposing lower face 10 supported upon a substantially horizontal surface 9. Three parallel recesses 8 in the upper face 11 are bounded by upstanding edges 12, the ends of which are substantially coplanar. A recess 13 in the upper face 11 is bounded by upstanding edges 14 and separated from the recesses 8 by a channel 15 formed between the adjacent edges 12 and 14. A substrate of a thickness of 1-2 mm is found to be ideally suited for the purposes of the present invention. Although thicker substrates may be used, the hazards of tripping or stumbling over the surface increase as the thickness increases. Accordingly, the thickness is preferably no more than about 2 mm. If thinner substrates are used, the likelihood of the substrate buckling during processing, handling or installation increases.

The substrate 7 is an aluminium extrusion powder coated white for improved reflectivity, especially in the UV region. For compatibility with the preferred resins used in subsequent stages, a polyester powder coating resin is used, which is fully cured to provide a high gloss.

After loading onto the transport means 1, step no. 2 is passing the substrate 1 through the dispenser 3, where the recesses 8 are filled with a first powdered component and the recess 13 with a second powdered component, as shown in Fig. 2b.

Referring to Figs. 3a and 3b, the dispenser 3 includes two hoppers 16, 17 from which the first and second powdered components are delivered into the recesses 8 and 13 respectively. The components are gravity fed simultaneously while the substrate 7 is moved on the transport means 1 below the hoppers 16, 17. The thickness of the layers of powdered components are between about 0.5 and about 1 mm.

The first powdered component includes a resin mixed with a photo-luminescent pigment, and the second powdered component includes a resin mixed with friction enhancing material.

The preferred thermoset resin of this invention is a polyester, the resins used in both components may be the same or different classes of polyester. There are many polyester resins available on the market from several different suppliers. The polyesters that are preferred for mixing with the photo-luminescent pigment are those that are transparent to a range of frequencies of radiation and feature good strength, and hardness when fully cured. The cured resin should possess these properties over a wide temperature range while at the same time providing resistance to impact, and cracking. A particularly effective resin for this use is a polyester sold as TPE by Orica NZ. A flow improving additive and degassing agent, preferably in the form of a silica fume, is also added to the powdered components.

The friction enhancing material is preferably grit. Silicon carbide, aluminium oxide and silica are three types of grit that can be used although in a preferred embodiment, aluminium oxide is the grit of choice. A mixture of two or more of these compounds may also be used. In an embodiment of the invention intended for heavy commercial use, the aluminium oxide grit has a particle size distribution from 30 to 800 micron, but biased toward the 600-800 micron range. If the product of this invention is to be sold for uses that are less demanding than the commercial market, particles having a smaller grit size may be used, thus producing a less abrasive surface.

Referring to Figs. 3b and 4, both hoppers 16, 17 empty into a die 18 having a lower face (not shown) in sliding engagement with the substrate 7. The substrate 7 is laterally restrained between guides (not shown) and supported upon a roller 20 which may be driven. An opening 19 in the die 18 of hopper 16 (Fig. 4) is aligned with the recesses 8 and a trailing edge (not shown) of the die wipes the edges 11 and governs the depth of the powdered component in the recesses.

In step No. 3, the resin is cured for example by heating in the oven 4 to a temperature such as 160-200 degree C for 10-20 minutes, during which the powdered components fuse and bond to the substrate 7. As shown in Fig. 2c the resulting device includes three photo-luminescent strips 22 and an anti-slip strip 23 with a channel 15 therebetween. The channel 15 may contain (fused) traces of the first and second components which have spilled from the adjacent recesses 8, 13, the channel 15 thus serves to avoid contamination of the strips 22, 23 which may otherwise occur from such spillage. Such contamination would detract from the appearance of the device, whereas the trace amounts in the channel 15 do not detract from the aesthetics of the finished device. Step no. 4 is the cooling of the device, following which it may be removed from the transport means.

The device of the present invention is designed to improve safety by preventing slipping on landings, walkways, catwalks, work stations, platforms, ramps, etc. The device may be applied to stairs (facing upward adjacent to the edge of each step) or to floors. The substrate is held in place by bonding the lower face 10 adhesively to the floor, stair treads or the like. Such devices may be manufactured by the method of the present invention in a very cost-effective manner, avoiding the time and expense of additional forming or assembly stages and allowing simple, low cost equipment to be employed.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof.

Ecoglo Ltd
by their Attorneys
JAMES & WELLS

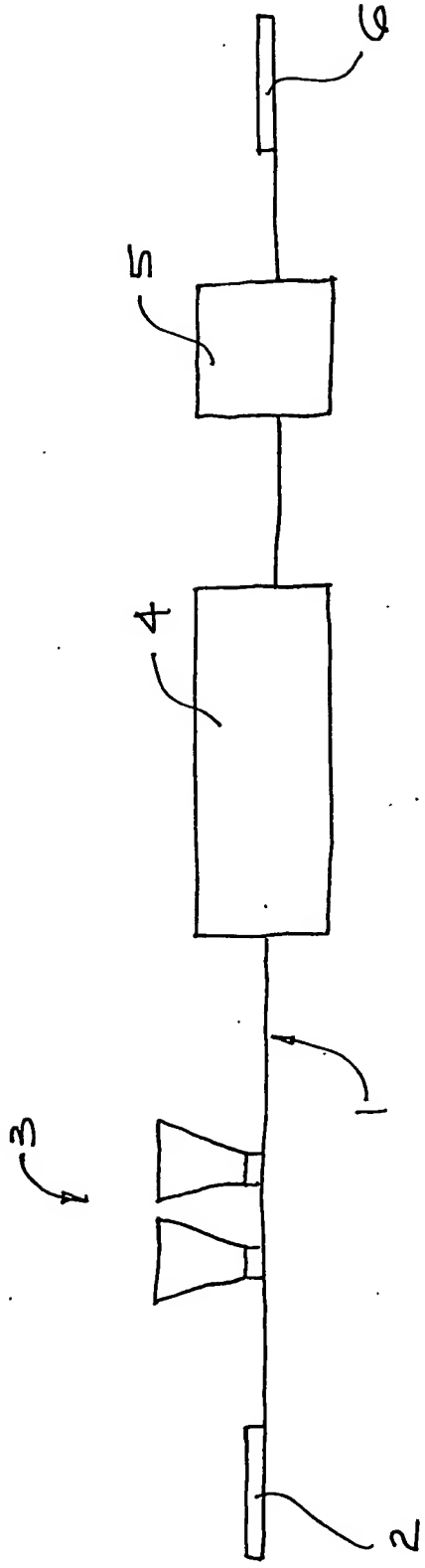

Fig. 1

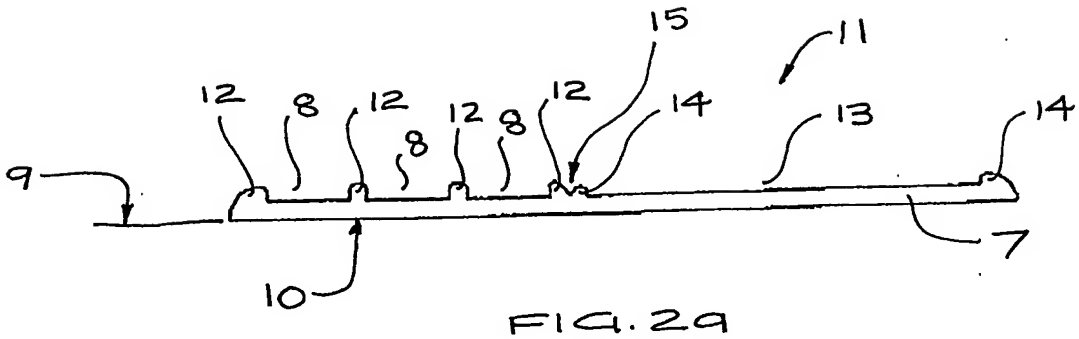

FIG. 2a

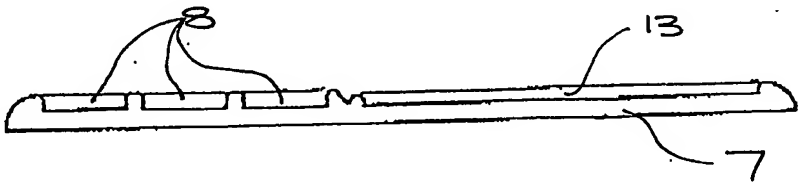

FIG. 2b

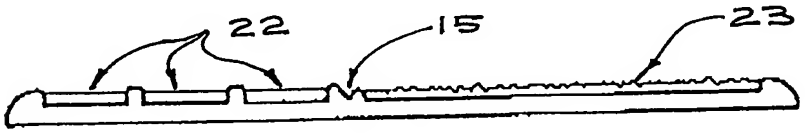

FIG. 2c

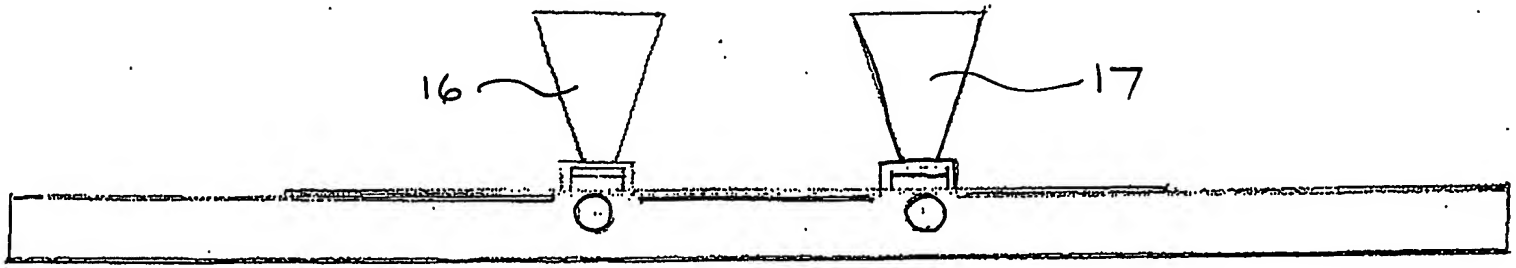

FIG. 3a

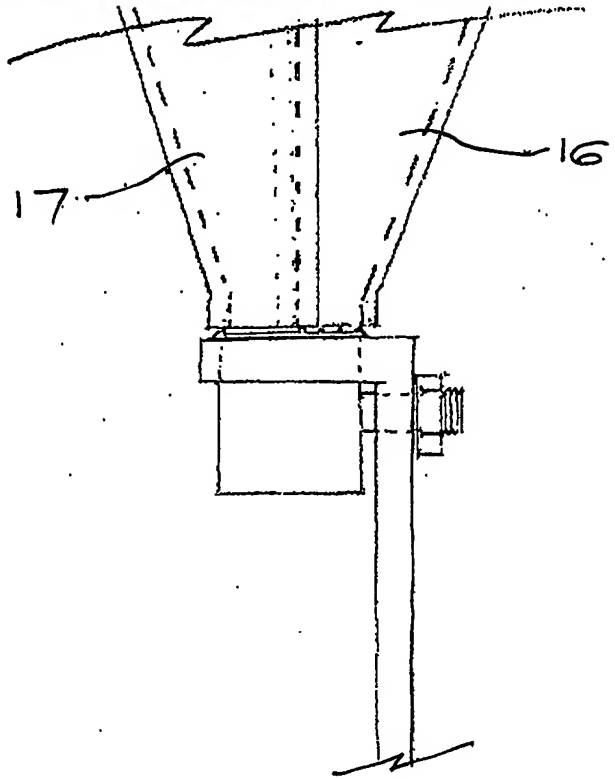

FIG. 3b

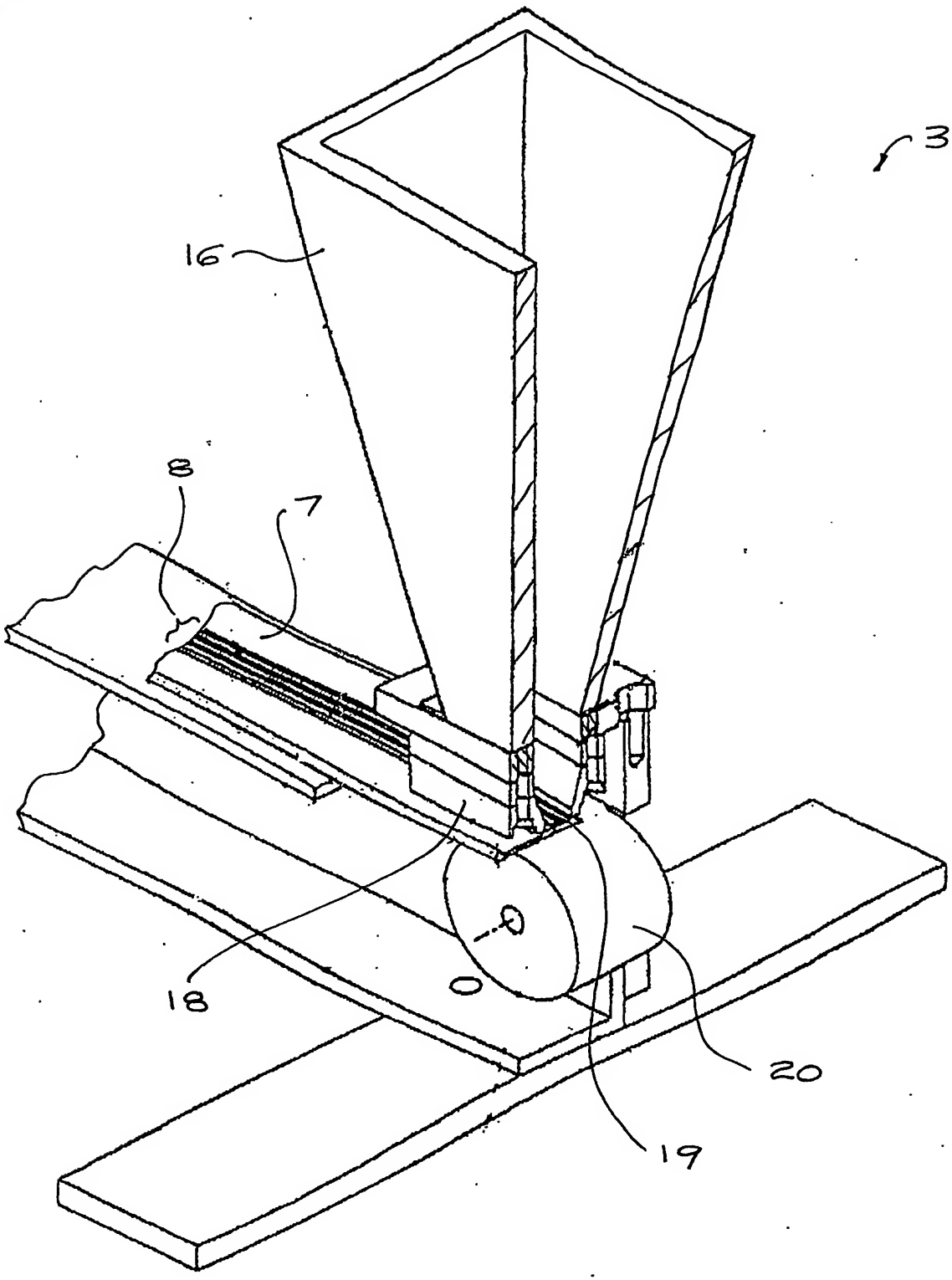

FIG. 4